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THIRTY-SIX BROAD-LEAVED EVERGREENS FOR THE CENTRAL MIDWEST[1]

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TODAY, more and more evergreens are being grown for their year-round appeal. In the Midwest, where few evergreens are indigenous, this trend is all the more understandable. There is an increasing demand for dwarf shrubs and small trees that will fit into the scheme of small modern gardens, and that will harmonize with today's small homes and low ranch-houses. The broad-leaved evergreen trees, shrubs and ground-covers are well adapted to these needs. Their use can also greatly improve old gardens as replacements for overgrown deciduous shrubs, which are not only difficult to maintain but frequently are out of proportion to the many architectural embellishments of older houses.

Woody evergreen plants fall into two groups: the *conifers*, cone-bearing plants with needle-like leaves (pines, spruces, junipers); and the *broad-leaved evergreens*, an extremely diverse group of woody flowering plants, related in most instances only by having leaves that remain green throughout the year—American Holly, Mahonia, and boxwood, for example. For convenience, the broad-leaved evergreens will be referred to subsequently as "broadleafs".

For their esthetic appeal, the broadleafs are unexcelled among ornamental plants. Some kinds, such as holly, Mahonia, and Pyracantha, produce colorful berries; the Southern Magnolia, Pieris, Mountain Laurel, are noted for their attractive flowers. Leaves of the various kinds differ widely in size, shape, and color. The broadleafs are likewise unexcelled in their low maintenance requirements. They are tidy of habit, dropping few leaves at any one time, and they never become overgrown and weedy as do many hardy deciduous shrubs. In addition, they remain relatively free from insect attack and disease.

According to a leading St. Louis nurseryman, evergreens were little grown in our area thirty years ago. Now perhaps a hundred kinds, most of which are obtainable from local nurseries, may be grown here; and of these, thirty-five to forty are broadleafs. Although Rhododendrons and evergreen Azaleas belong to this class, they are

[1] An extensive treatment of the broad-leaved evergreens for the entire country is found in the Brooklyn Botanic Garden Handbook No. 22, *Broad-leaved Evergreens*, which can be purchased for $1.00 from the Brooklyn Botanic Garden.

[2] Mr. Denison, of Kirkwood, Missouri, artist and accomplished plantsman, made the drawings for this paper, and his excellent plant notes provided many details concerning the culture of broad-leaved evergreens. His keen plant sense and long experience in growing ornamentals in this area made his frequent council refreshing and productive.

not included since they require special care and have been discussed in detail in the April, 1956 BULLETIN.

CLIMATE IN THE CENTRAL MIDWEST

The central Midwest, as defined for this paper, includes an area extending one hundred miles north, one hundred fifty miles east, and one hundred miles south of St. Louis, and west to Kansas City.

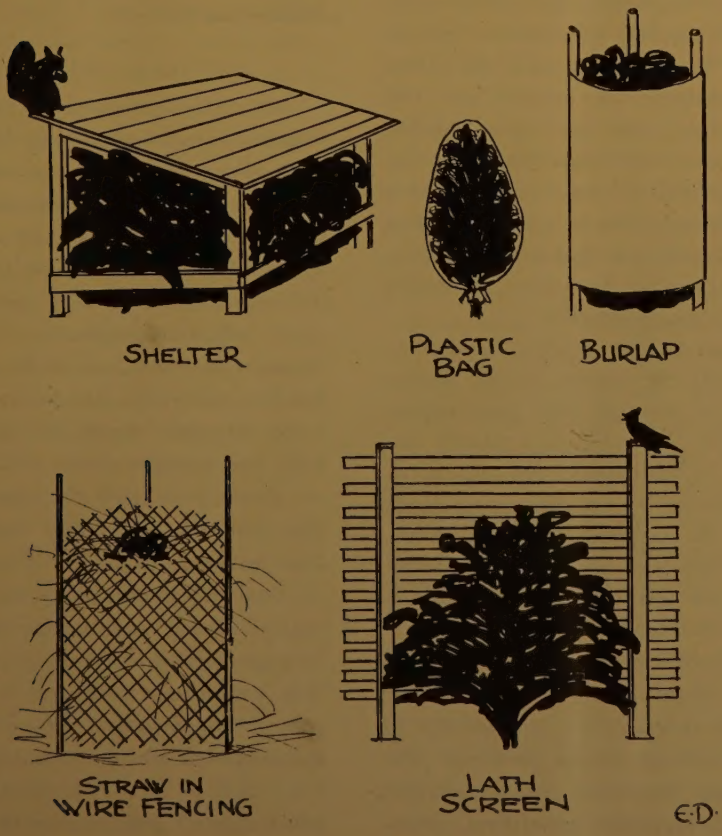
General: Sudden change characterizes the climate of mid-continental United States. Wide fluctuations in temperature, long drought periods, drying winds, and bright sun may occur at any season of the year. These climatic factors which account for the weather patterns in the Midwest are all too well-known to residents throughout our area. Maximum temperatures in summer, minimum winter temperatures, precipitation and atmospheric humidity are not limiting factors in themselves in growing broadleaved evergreens in our area. It is the timing of the climatic factors—temperature, precipitation, wind, solar radiation—which matter to the plant and to the plantsman. Relatively high temperatures one day followed by freezing temperatures the next, accompanied by bright sunny weather and freezing winds, are the chief limiting factors in growing broadleafs in the central Midwest.

Winter: Our winters normally are characterized by long intervals of bright sun, especially during January and February, with periods of drying, freezing winds while there is little snow protection. Sudden temperature changes, sometimes with a 30–40° differential from one day to the next during the period from November to April, are common. Alternate freezing and thawing, especially towards the end of February or March, just as the plants begin to grow, inflict considerable damage some years. Likewise, an early freeze in November often does more damage to broadleafs than 20° below zero in January. In fact, many plants may be relatively unharmed by continuous freezing yet will succumb to sudden temperature changes. It is largely due to alternate freezing and thawing that camellias and some other kinds of broadleafs may not be successfully grown in our area. *Sun-scald* may inflict much damage by causing

Broadleafs not sun-resistant can be placed on north side of house for half shade during summer and full shade in winter when sun is low. From Brooklyn Botanic Garden.

the leaves to turn brown, and the plants to defoliate. Broadleafs which are exposed to sun while the ground is frozen or when the humidity remains relatively low—frequently around 20 per cent in January and February—will sunscald if the water intake from the soil is insufficient to offset transpiration. This condition is accelerated by dry north and west winds. Most broadleafs considered to be hardy here will not tolerate full sun but require protection of some sort. One should know whether the kinds in question tolerate full sun, partial shade or full shade.

Providing the correct micro-climate should be the initial consideration before attempting to plant broadleafs. Most kinds grown here require protection of hedges, trees, buildings, walls, and shelter sheds, especially in winter. The shade of a tree would provide the correct micro-climate for growing ivy, or the shaded north side of a building would provide the required micro-



Various methods for protecting young broad-leaved evergreens from winter sun-scald. Upper left drawing after Brooklyn Botanic Garden.

climate for Leucothoë, Pachysandra and other kinds requiring full shade.

Well-established plants may be expected to withstand the rigors of our climate more satisfactorily than young or newly planted ones. Aids for preventing winter damage to young plants, especially if it is difficult to provide natural protection, include: (1) the use of polyethylene bags, provided with air-holes, to completely envelope the young plants, (2) plastic wax sprayed on the foliage in late autumn to prevent excessive water loss during freezing weather (obtainable from nurserymen under several commercial names). Potassium chloride applied to the soil around the plants in September (2 pounds per 100 square feet), has been recommended, though not fully tested, for hardening-off broadleafs (favorable results have been obtained from its use on Camellias in the South and on evergreen azaleas in St. Louis). For other protection methods see illustration.

Summer: The greatest damage to broadleafs in summer occurs during periods of drought with temperatures above 90° F. and with a relative humidity of less than 30 per cent, often accompanied by hot desiccating winds from the Great Plains. However, these conditions are easier to control and cause less damage to broadleafs than wintertime conditions.

We have learned through experience which plants grown in our latitude respond favorably or unfavorably to the prevailing climatic patterns. The Common Boxwood *(Buxus sempervirens), Magnolia grandiflora,* Nandina and some of the hollies probably would not thrive more than 100 miles north of St. Louis even with maximum protection. On the other hand, 60 miles south of St. Louis, these same plants grow with almost complete abandon.

Most of the broadleafs are immigrants to our gardens from China, Japan or parts of Europe, although several kinds are indigenous to the southeastern United States. The American Holly occurs in southeastern Missouri and is the only indigenous broadleaf shrub of the state. For this reason it thrives in most parts of the central Midwest in full sun.

CULTURAL METHODS

Soil: Soil conditions for growing broadleafs in our area range from bad to excellent. In some areas with poorly drained clay soil, considerable improvement in tilth would be essential. Most kinds require a well-drained soil with a relatively high (40–50 per cent) organic component for most vigorous growth. Leaf mold and peat moss are easily obtained sources of organic material. Especially do broadleafs like nitrogen, since these plants are grown principally for their leaves. The yellowing of hollies and other broadleafs may be overcome by adding to the soil additional quantities of organic matter and a relatively high nitrogen fertilizer. A 10–10–10, N–P–K commercial fertilizer is acceptable. Most broadleafs grow best in soil somewhat acid to neutral (pH 5.0–7.0. Soil of pH 7 is neutral; pH values above 7 indicate alkaline soil and values below 7 indicate acid soil.

Broadleaf shrubs may be planted near deep-rooted hardwoods, such as oaks, hard maples, hickories, and sweetgums; they should not be planted near soft-maples, elms, sycamores, poplars, willows or other trees with masses of surface roots which will compete for water. A few of the ground-covers, especially ivy and Vinca, may be planted under soft-maples or elms with complete success.

Planting Broadleafs: First excavate to two feet deep and three times the width of the plant (discard all heavy clay). Refill the hole with a mixture of 1 part sand, 2 parts organic material (leaf mold, peat moss or garden compost) and 3 parts top soil. Mix in ¼ cup ammonium sulfate per bushel of soil. Plant in soil that does not waterlog. For best drainage a raised location should be chosen, or prepare a bed 6 inches above ground level.

Mulching: Broadleafs usually require more water than deciduous shrubs. Mulches act as insulators. They help to maintain lower soil temperatures in summer, prevent deep freezing of soil in winter, and greatly reduce evaporation of water from soil surface. An organic mulch, 3–4 inches deep, of sawdust, wood chips, pecan shells, buckwheat hulls or leafmold may be used. All of these recommended materials, with the exception of leafmold, are low in cellulose and will require 2 pounds of ammonium sulfate to each bushel of mulch to prevent nitrogen starvation of the plant during decay of the mulch.

Transplanting: Since most of the broadleafs have fleshy roots, transplanting of field-grown stock is best accomplished just prior to the growing season in spring. Balled and burlaped material is preferred over bare-root stock. Plants grown in tin cans usually may be transplanted at all seasons.

Propagation: The accelerated interest in broad-leaved evergreens may be attributed, partly at least, to several recent advances in propagating techniques. The use of mist propagation and improved methods of grafting have been largely responsible for the increased popularity in growing the named forms of American Holly. Other broadleafs, formerly uncommon and difficult to propagate, now have become common. Propagation under polyethylene plastic tents has also become a highly successful method.

Maintenance and Disease: Homegardeners today favor kinds of ornamental shrubs which require less maintenance than do most deciduous kinds, such as privet, forsythia, mock-orange, etc. The broadleafs possess all their virtues and few of the undesirable traits. Some of the hollies develop into more shapely plants when given a yearly pruning, cutting back four to five inches of tip growth; but hardly ever is it necessary to keep broadleafs within bounds in the same way as for most deciduous shrubs.

The broadleafs, in general, are remarkably free from insect pests and fungus attacks. The American Holly, Japanese Pieris, Vinca, and Ivy are the only broadleafs grown in our area known to be occasionally attacked by insects or fungus infections.

GROUND-COVERS

1. *Bignonia capreolata* (Trumpet Vine Family). 5–6 inches. CROSS VINE
Introduced to Gardens, 1864. Southeastern United States

A climbing evergreen with orange-red, trumpet flowers 1–2″ long, and lustrous, paired leaves that are oriented on the stem in the form of a cross. It is completely hardy in either sun or shade, although the leaves may turn bronze-green in winter. Vigorous plants may grow a foot a year, yet they maintain a neat, attractive habit without becoming excessively rampant. It grows in well-drained neutral soil and is useful on steep slopes, as well as on trellises or trees. A little-known plant in cultivation.

2. *Euonymus fortunei* (Spindle-Tree Family). 12 inches.
PURPLE-LEAF WINTER-CREEPER
Introduced to gardens, ca. 1865. China

This common evergreen ground-cover grows vigorously in a wide variety of soil types, in either sun or shade. It will thrive, even with neglect, although after several years a mass planting takes on a disheveled appearance,

due to the scraggly growth habit. In winter sunlight, the leaves turn bronze-green. Good for sunny banks. Scale insects attack this plant but they can be controlled with "Malathion".

3. *Hedera helix* (Ginseng Family). 4–5 inches. COMMON IVY
Cultivated since ancient times. Europe

The Common Ivy ranks first among the useful, reliable, and rapid-growing broadleaf ground-covers for our area. Its habit of climbing over walls and on trees gives it a special place in our gardens. Cuttings 4–6 inches long, taken in May and inserted directly into the soil for half their length and a foot apart, will root quickly and develop considerable growth the first season.

Variability in leaf shape of the Common Ivy.

It grows best in a soil pH 6.0–8.0.

*Cultivars**—'MBG Bulgaria'. Leaves 4–5 inches wide, shallowly lobed, not prominently veined. A vigorous grower that resists winter injury, and drought; thrives best in full shade but will grow in partial to full sun. Introduced by the Missouri Botanical Garden in 1936.

Bulgarian Ivy at Missouri Botanical Garden.

* The term *cultivar* is used to denote the various forms of a plant which have arisen in cultivation. This term supercedes the term *variety*, which refers more precisely to variants of a species in the wild.

'Baltic'. Leaves 3–4 inches wide, deeply lobed; prominently veined. Growth less vigorous than 'MBG Bulgaria'.

(The English Ivy, although widely used, is not completely hardy in severe winters and is not recommended for permanent plantings in our area.)

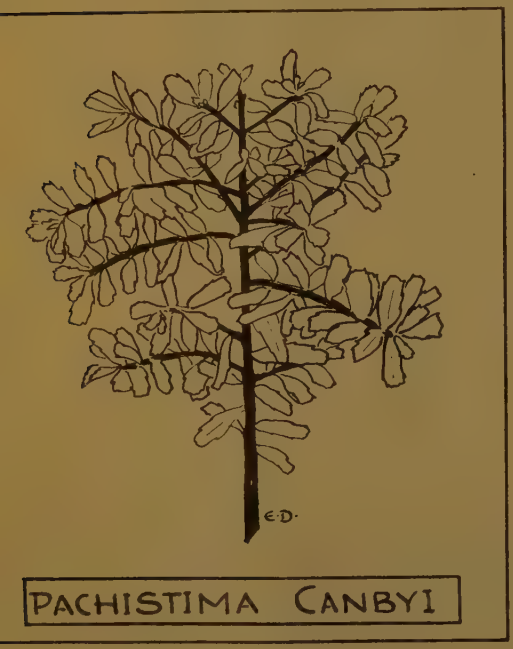
4. *Pachysandra terminalis* (Boxwood Family). 6–8 inches. JAPANESE SPURGE
Introduced to gardens, 1882. Japan

A highly esteemed low-growing, carpeting plant, with light green serrated leaves, disposed in whorls near the tips of greenish succulent stems. Small yellow-green flowers aggregated in small heads appear in the spring. A long-lived plant that spreads by rhizomes and grows more slowly than ivy or periwinkle. It should be grown in full or partial shade and in perfectly drained acid soil with a 50 per cent humus content.

5. *Pachystima canbyi* (Euonymus Family). 12 inches.
SMOKY MOUNTAIN PACHYSTIMA
Introduced to gardens, 1880. Great Smoky Mountains

A distinctive, dwarf, spreading evergreen shrub, with wedge-shaped, dark green, and highly lustrous serrated leaves about an inch long. In winter the foliage often takes on a tarnished sheen when exposed to the sun. It grows slowly, but spreads fairly rapidly by rooting of the branches in con-

tact with the soil. This plant is fully hardy throughout our area and is reported to be grown as far north as North Dakota and Minnesota. Needs protection from sun in winter. Plant in a slightly acid soil, pH 6.0–7.0, on the north or east side of a building or under deep-rooted trees with additional protection from north and west winds.



6. *Sarcococca hookeriana* var. *humilis* (Boxwood Family). 12 inches.

CHINESE DWARF BOX

Introduced to gardens, ca. 1907. China

An interesting dwarf, densely tufted shrublet with narrow, glossy, lance-shaped leaves that remain fully evergreen the entire year. The inconspicuous greenish white flowers reminiscent of boxwood are borne in the leaf axils in earliest spring. The plants are relatively slow-growing at first, but reach maturity in 4–5 years. They should be grown in full shade to prevent winter sun-scald. The north side of a dwelling or in the lee of a hedge or wall are suggested locations. This plant, although promising, has not yet been fully tested for hardiness in our area. Does best in well-drained neutral or slightly alkaline soil with a 50 per cent organic content. One of the newer broadleaf introductions.

7. *Vinca minor* (Oleander Family). 4–5 inches. MYRTLE, PERIWINKLE
Cultivated since ancient times. Europe

A very reliable old-favorite ground-cover which will grow under a wide variety of conditions. The dark green, glossy leaves, about an inch long, are borne on weak, reclining stems which quickly take root in contact with the soil, spreading the plant in all directions. In April and May, the erect new growth and small blue-violet flowers, about one-half inch in diameter, contribute a vernal freshness not associated with some other broadleaf ground-covers. Iron-clad for hardiness throughout our area, the Myrtle does best in full shade, in well-drained neutral soil with a relatively high organic content. The leaves often burn rather severely in full sun during hot, dry summers.

Cultivars—'Bowles' produces blue flowers larger than those of the common type. White and purple-flowered forms sometimes are grown.

SHRUBS

SPECIAL USES OF BROADLEAF SHRUBS

	Hedges to 8 ft.	Hedges over 8 ft.	Fruits	Flowers
Berberis julianae	×			
Bignonia capreolata				Red-orange
Buxus microphylla var. *koreana*	×			
Buxus sempervirens	×			
Elaeagnus pungens		×	Silvery	White
Ilex cornuta	×		Red	
Ilex cornuta 'Burfordii'	×		Red	
Ilex crenata	×			
Ilex glabra	×			
Ilex opaca	×	×	Red	
Ilex pernyi			Red	
Ilex vomitoria	×	×	Red	
Kalmia latifolia				Pink
Leucothoë catesbaei				Creamy-white
Magnolia grandiflora				Creamy-white, 8–10″ across
Mahonia aquifolium			Blue	
Mahonia bealei			Blue	
Nandina domestica			Orange-red or yellow	
Osmanthus ilicifolius	×			
Pieris japonica				Creamy-white
Prunus caroliniana				Pinkish-white
Pyracantha coccinea		×	Orange to red	
Viburnum rhytidophyllum			Red to black	

8. *Berberis* × *chenaultii* (Barberry Family). 3–4 feet. CHENAULT BARBERRY
Known in cultivation, 1928. Garden hybrid.

A highly ornamental hybrid barberry (*B. gagnepainii* × *B. verruculosa*) similar to *B. verruculosa* in its semi-dwarf spreading habit but differing from that species in its narrower, longer (1½–2″) leaves, and longer spines. Does not object to full sun here in summer; but needs partial shade in winter to prevent sun-scald. Highly recommended.

Berberis julianae

9. *Berberis julianae* (Barberry Family). 6–8 feet. JULIANA BARBERRY
Introduced to gardens, 1900. China

Highly prized for the leathery, shiny, spine-tipped leaves and the attractive, gently arching lateral branches. Clusters of chartreuse flowers, about one-quarter of an inch in diameter, appear among the leaves during April, followed by bluish berries in late summer. Growth is rapid—plants 15–18 inches high will produce a three-foot hedge in as many years. Fully hardy, although some of the leaves may become reddish or tarnished after the first hard freeze. Drought-resistant, once established. Develops best in full sun; shade-grown plants become leggy. An excellent hedge or screening plant.
Cultivars—'Nana', a dwarf form. 'Pyramidalis', an upright form with ascending branches.

10. *Berberis sargentiana* (Barberry Family). 4–5 feet. SARGENT'S BARBERRY
Introduced to gardens, 1904. China

Similar to the Juliana Barberry but with narrower leaves. At the Missouri Botanical Garden, specimens of the Sargent's Barberry are as hardy as the Juliana Barberry, though less attractive. May be grown like the latter species.

11. *Berberis triacanthophora* (Barberry Family). 4–5 feet.

THREE-SPINED BARBERRY

Introduced to gardens, 1907. China

Closely related to *Berberis verruculosa* but differs from it in having larger, 3-spined leaves and a more upright habit. Hardy here but rarely grown. A handsome plant. Should be grown in the same way as *B. verruculosa.*

12. *Berberis verruculosa* (Barberry Family). 3–4 feet. SILVERLEAF BARBERRY

Introduced to gardens, 1904. China

A densely branched, dwarf spreading shrub, usually about as wide as high. Outstanding characteristics are the spiny leaves with waxy bloom beneath, contrasting with the lustrous green of the upper surface. In April, small yellow flowers, about one quarter of an inch in diameter, appear among the leaves along the underside of the stems, followed by clusters of small, blue, bloom-covered berries in late summer and autumn. Full sun to half shade in mid-summer with somewhat more shade in winter is recommended to prevent the leaves from burning. As a low hedge or border plant this barberry is unexcelled. Slow growing. Does best in a well-drained, slightly acid soil, pH 6.0–7.0.

13. *Buxus microphylla* var. *koreana* (Boxwood Family). 4–5 feet.

KOREAN BOXWOOD

Introduced to gardens, 1919. Korea

Reputed to be the hardiest boxwood for our area. Temperatures of 20° below zero within the past twenty years have not seriously injured the specimens at the Missouri Botanical Garden Arboretum. Vigorous young individuals will grow about 3 inches a year. Plants 20 years old should stand 5 feet high. Forms a dense, much branched globose or pyramidal shrub, hardly distinguishable from the Common Boxwood *(Buxus sempervirens)*. However, unlike the Common Boxwood, the leaves of the Korean species are dull and become bronze green, especially in the winter sun. Shade-grown plants

remain greener. May be grown in full sun, without protection. Prefers a well-drained soil, with a 50 per cent organic content, pH 6.0–8.0.

Variety—sinica, from China. Of more upright growth habit, the leaves larger and more bronze in winter than var. *koreana.*

Buxus microphylla var. *koreana*

14. *Buxus sempervirens* (Boxwood Family). 10–12 feet. COMMON BOXWOOD
Known in gardens since ancient times. Europe

Highly esteemed for the small, fragrant glossy leaves and the dense globose growth habit. Pyramidal and columnar types are also grown. Despite the slow growth—about two to three inches per year—few plants we grow can offer more in reward for the patience required to produce a mature boxwood specimen. The Common Boxwood is less hardy in youth than older well-established plants and should be protected from sun and freezing winds in winter. Plant in well-drained soil; boxwood loathes wet feet, especially in winter. An occa-

sional sprinkling of agricultural lime once a year is recommended to maintain a slightly alkaline soil, pH 7.0–8.0. *Cultivars:* Some of the hardiest forms come from Washington, Missouri, where boxwood has been grown for 100 years. A form more recently introduced by the Missouri Botanical Gardens from Jugoslavia has been successfully grown in the St. Louis area over the past twenty years. Other kinds of unknown origin are grown here.

Buxus sempervirens

15. *Elaeagnus pungens* (Russian Olive Family). 10–15 feet.

EVERGREEN ELAEAGNUS

Introduced to gardens, 1830. Japan

A much-prized, densely branched, round-headed shrub, known for its attractive silvery evergreen leaves 1–2 inches long, and the fragrant white flowers borne in September to December. Golden-brown stellate hairs are dispersed like small polka-dots over the silvery ovate leaves and branches. Well-established plants are fully hardy if given the protection of surrounding

trees from freezing winds and winter sun. Does not object to full sun in summer. Young plants given additional protection will grow 8–10″ a year. Prefers a well-drained soil about neutral in reaction. A good hedge plant. *Cultivars*—'Fruitlandii'; 'Reflexa'; 'Simonii'. These forms differ in the size and shape of the leaves and in the habit of growth.

16. *Hedera helix* 'Arborescens' (Ginseng Family). 6–8 feet. SHRUB IVY

Ivy may produce two kinds of leaves, juvenile and adult, on the same plant and is thus dimorphic. As a creeping ground-cover, the plants produce only juvenile leaves year after year and will never flower. Yet, if the plants are permitted to climb on a tree trunk or wall they develop mature leaves and, eventually, flowers. Changes from juvenility to adulthood are evidenced by a transition from lobed to almost unlobed leaves, and by the development of terminal flowering branches. The many forms of ivy long grown as house plants are in the juvenile state.

Shrub Ivy plants are produced from cuttings taken directly from the mature branches. A rooted scion eventually develops into an erect ivy shrub. Cuttings taken in July, during the peak of the growing season, can be

HEDERA HELIX VAR. ARBORESCENS

rooted very successfully by the method of mist propagation. In autumn and winter, cuttings may be rooted under a plastic tent indoors. Grows well in any good garden soil, pH 6.0–8.0.

HOLLIES

Sex in hollies: With few exceptions, hollies are dioecious; that is, their flowers are of two kinds, male (staminate) and female (pistillate), which are borne on separate plants. The more common condition among flowering plants is the bisexual flower, with the male and female parts together in

Flowers of American Holly: left, female; right, male.

a single flower. In most hollies, both male and female plants are required for the production of berries, especially berries with viable seeds. But quite commonly, a small percentage of bisexual or perfect flowers occurs on female plants giving rise to berries, but with inviable seeds. A male branch may be grafted on a female specimen in lieu of having a separate male plant, although this method has met with varying degrees of success.

Ilex aquifolium 'Balkan'

17. *Ilex aquifolium* 'Balkan' (Holly Family). 20 feet. BALKAN HOLLY
Missouri Botanical Garden introduction, 1936. Southeastern Europe

Ilex aquifolium, commonly known as the English Holly, is an extremely variable species with a wide geographical distribution, extending from Great Britain, southeastward across Europe to Asia Minor. The form occurring on the Balkan peninsula may be considered a geographical variant of the English Holly. It differs from the English form by its greater hardiness

and dull leaves. In our climate, the Balkan Holly is the hardiest form of *I. aquifolium* known. Except for frost damage to late autumn-grown shoots, the specimens at the Missouri Botanical Garden have thrived for the past twenty years with only slight protection. The soil requirements are the same as for other hollies.

18. *Ilex cornuta* (Holly Family). 8–10 feet. CHINESE HORNED HOLLY
Introduced to gardens, 1846. China

One of our most interesting holly introductions. Known for its dense branching habit, lustrous, 3- to 5-spined leaves about 3 inches long. The red berries (larger than the American Holly) are borne in clusters which persist throughout the winter. Young vigorous specimens produce 8–12 inches of new growth a year in well-drained soil, pH 5.0–6.5, with about a 50 per cent organic content. A well-established plant (3–5 years in one location) can withstand full sun if protected from north and west winds. Young newly planted ones require shading to prevent sun-scald during January and February.

Cultivar—'Rotunda', an interesting, low spreading plant 4–5′ tall; leaves narrower and somewhat longer than the typical form.

Size relationships of holly leaves.

19. *Ilex cornuta* 'Burfordii' (Holly Family). 10 feet. BURFORD HOLLY
Known in cultivation, 1895. Garden origin

Similar in growth habit to the Chinese Horned Holly, but with very short-spined or spineless leaves. Known especially for its red berries and extremely lustrous, dark green leaves, which are convex on the upper side. This cultivar produces only bisexual flowers and therefore all plants may produce berries. As hardy as the Chinese Horned Holly and may be grown like it.

The Burford Holly, a sport of the Chinese Horned Holly, was discovered in a batch of seedlings by Thomas H. Burford, superintendent of a famous cemetery in Atlanta, Georgia. In our area, it fails to fruit regularly, although specimens of considerable age are thriving here, especially around St. Louis.

20. *Ilex crenata* (Holly Family). 2–8 feet. JAPANESE HOLLY
Introduced to gardens, 1864. Japan

Known for the wide diversity in growth habit and in leaf shape. Numerous cultivars are known, all of which make good hedge or specimen plants. The various forms are fast-growing and are easy to maintain. Grows best in well-drained soil, pH 5.0–6.5.

Cultivars — 'Rotundifolia'. Leaves ovate, pointed, 1¼ inches long, flat; plants 6–8 feet, largest of the cultivated forms. Tolerates nearly full sun in summer, but requires partial to full shade in winter. The most widely grown cultivar.

'Convexa'. Leaves ovate, without a point, about ½–1 inch long, convex on the upper surface; plants 3–4 feet with a spreading top. Needs more

shade in summer than 'Rotundifolia'. Excellent for a low hedge.

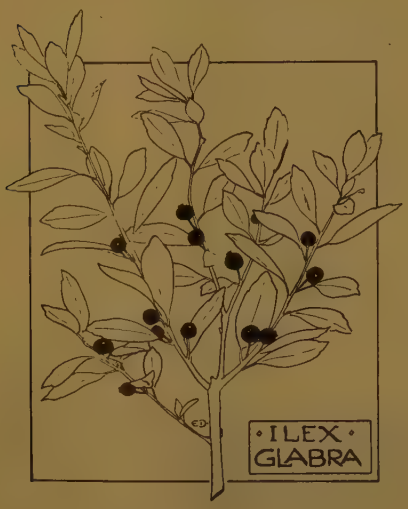
'Helleri'. Leaves lance-shaped, about ¾–1 inch long, flat; plants dwarf, up to 2 feet. Grows best in shade. Excellent for a low hedge.

'Stokes'. Leaves lance-shaped, about ½–¾ inches long, flat; plants 3–4 feet high. Grows best in partial shade. Excellent for a low hedge. Patented form from Warren Stokes, Butler, Pa.

Several other named forms are available from nurserymen.

21. *Ilex glabra* (Holly Family). 4–6 feet. Introduced to gardens, 1759.

INKBERRY
Southeastern United States



One of the black-berried native American hollies, known for the dense bushy habit, reminiscent of the Japanese Holly *(Ilex crenata)*. The leaves are about 2 inches long, blue-green and dull. Relatively unknown in gardens here, probably because the dull foliage is less attractive than the Japanese Holly and other broad-leaved evergreens with small lustrous leaves. For hardiness, the Inkberry ranks near the top of the list. Furthermore, plants are easy to establish, and growth up to 6 inches a year may be expected in young plants. Does best in a fairly acid soil, pH 4.5–6.0. Drought-resistant and does not sun-scald in winter. Excellent for hedges.

22. *Ilex opaca* (Holly Family). 20–30 feet. Introduced to gardens, 1744.

AMERICAN HOLLY
Eastern United States

Known for the evergreen, spine-tipped leaves and red berries. It is the hardiest of the broad-leaved trees grown in our area. The finest specimens are produced in full sun. Fewer leaves and berries result when specimens are grown in shade and the plants tend to become somewhat leggy. In full sun the American Holly remains fully green and does not sun-scald or discolor in summer or winter. May be planted as a lawn specimen; also ideal as a hedge plant. Young seedlings grow 6–8 inches a year. Does best in acid soil, pH 5.0–6.0. The American Holly is a native of southeastern Missouri.

Cultivars—Outstanding are 'Arden', 'Clark', 'Croonenberg', 'East Palatka', 'Griscom', 'Hedgeholly', 'Hookstraw', 'Howardii', 'Manig', 'Merry Christmas', 'Old Heavy Berry', 'St. Mary'. Many others available from specialists.

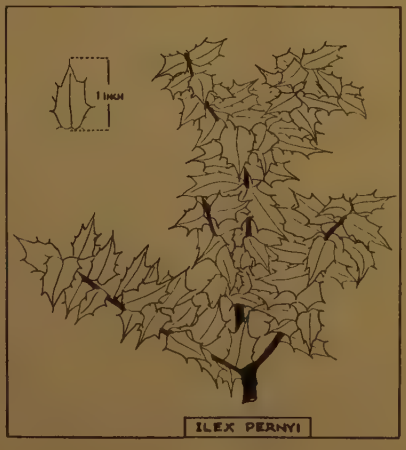
Insect Pests—The leaf-miner is often

Ilex opaca

rather bad. It burrows under the epidermis of the leaf causing whitish and blistered areas. It may be controlled with an emulsion containing 25 per cent DDT, diluted 1 ounce to each 2 gallons of water; or a wettable powder containing 50 per cent actual DDT can be used at the same dilution. Spraying should begin around May 10 to May 15; two sprays, 10 days apart should be given.

23. *Ilex pernyi* (Holly Family).
8–10 feet. PERNY HOLLY
Introduced to gardens, 1900. China

Similar to the American Holly in growth habit, but with much smaller leaves, about 1–1½ inches long, lustrous and spine-tipped. They appear as if plaited on the branches. Little known, perhaps due to its slow growth; however, a well-grown specimen laden with red berries is most rewarding.



Not quite as hardy as the Chinese Horned Holly. Demands full shade in winter and half sun in summer. A site on the south side of a wall, near a high hedge or in the shadow of a dwelling with further protection by high trees will aid in preventing sun-scald to the leaves in winter. An acid, well-drained soil, pH 5.0–6.0, and high in organic matter is recommended.

24. *Ilex vomitoria* (Holly Family). 15–20 feet. YAUPON
Introduced to gardens, 1700. Southeastern United States

Known for the glossy, slightly serrated leaves ½–1½ inches long, the symmetrical, pyramidal growth form, and the small red berries. Although a native American species, the Yaupon is not as hardy as the American Holly. Young plants should be protected from winter sun and freezing winds. Best planted on the north side of a building or in the shade of a tall hedge or deep-rooted trees, such as oaks and hard maples. An excellent hedge plant.

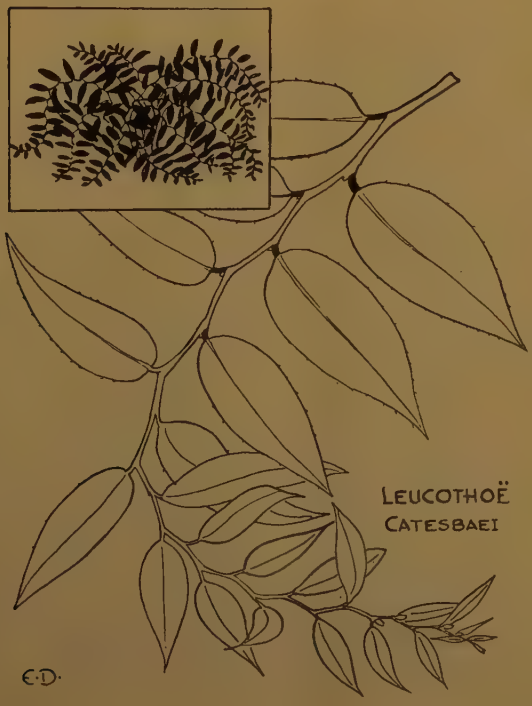
25. *Kalmia latifolia* (Heath Family). 5–6 feet. MOUNTAIN LAUREL
Introduced to gardens, 1734. Southeastern United States

When well-grown, the Mountain Laurel is one of the finest of flowering shrubs. Although hardy throughout our area, this plant never develops the vigor it does farther east. It objects to drought and will sun-scald in winter sun. Should be grown in complete shade with protection from strong winds at all times. If cultural requirements can be met, quite respectable plants of the Mountain Laurel can be grown in our climate. The clusters of cup-like, light to deep pink flowers in May are the most distinctive features of this plant. Prefers a well-drained acid soil, pH 5.0–6.0.

26. *Leucothoë catesbaei* (Heath Family). 2–4 feet. DROOPING LEUCOTHOË
Introduced to gardens, 1793. Southeastern United States

Well-established plants develop an interesting, mound-like habit of growth. In May, the pendant trusses of creamy-white Pieris-like flowers are borne at the ends of the arching, smooth green branches, and contrast with the sage-green willowy leaves, 2–4 inches long. Rather slow to establish but the maximum height should be attained in less than ten years. Completely hardy throughout our area if planted in full shade. Sun will burn the leaves, summer or winter. Grown with considerable effect in a woodland landscape or as a low hedge along a shaded border; a bank or slope would suit the natural arching habit of this species. Spreads by underground runners.

~ILEX VOMITORIA~



27. *Magnolia grandiflora* (Magnolia Family). 20–30 feet. SOUTHERN MAGNOLIA
Introduced to gardens, 1734. Southeastern United States

A small tree in our area, highly esteemed for the handsome leathery leaves and waxy-white fragrant flowers, six to eight inches across. Leaves from 6–12 inches long and 4–5 inches wide are most common, but forms with leaves 2–3 inches and up to 6 inches wide sometimes occur. Brownish felt-like tomentum on the underneath surface of the leaves lends considerable beauty to some variants, but in other forms the leaves are completely glabrous on the lower surface. Flowering occurs mostly in June, but may continue sporadically all summer. In late summer and autumn, the seeds, with their bright red arils, further enhance the plant as they protrude from the brownish, felted cone-like seed pods. Plants less than ten years old are relatively tender and may freeze to the ground, but the roots rarely are killed. In winter, protection should be provided in the form of a burlap-covered frame. Old specimens rarely freeze back, although the leaves may turn brown during severe winters. An acid, well-drained soil, pH 5.0–6.0, suits this magnolia. Should be planted in full sun or partial shade. Flowering is prevented in full shade.

28. *Mahonia aquifolium* (Barberry Family). 4–8 feet. OREGON GRAPE HOLLY
Introduced to gardens, 1823. Western United States

A stiffly erect shrub spreading from rhizomes and suckering to form a dense bushy specimen or colony. Known for the lustrous, pinnately divided, spine-tipped leaves. The plant is extremely variable as to leaf shape and habit of growth. Racemes of chartreuse flowers are produced in early spring, followed in June by clusters of succulent, blue berries which are useful for making a mild-flavored jelly. Mature plants may be grown in about ten years. One of the few broadleafs fully hardy in either full sun or shade. Throughout our area the largest plants develop in semi-shade. In full sun the leaves turn maroon to brick-red in winter. Very adaptable in most well-drained, slightly acid to alkaline soils, pH 6.0–8.0.

29. *Mahonia bealei* (Barberry Family). 4–5 feet.

JAPANESE OR LEATHERLEAF MAHONIA

Introduced to gardens, ca. 1660. China, Japan

Similar in aspect to the Oregon Grape Holly, but with stiffer, larger, thicker leaves, larger flowers and fruit. The handsome waxy leaves are about 12 inches long, somewhat drooping, whitish blue-green underneath and dull green above. Racemes of yellow flowers are borne at the summit of the plant in April. Grape-like clusters of blue berries follow in early June. In rich soil a growth of 6 inches a year may be expected. Completely hardy if planted in shade; but winter sun burns the leaves. Grows superbly on the north side of a dwelling or in a woodland beneath deep-rooted trees, such as oaks, hard maples, and hickories, in well drained soil high in organic matter, pH 6.0–8.0.

30. *Nandina domestica* (Barberry Family). 4–5 feet. NANDINA

Introduced to gardens, 1804. China, Japan

Known for the much-divided, almost fern-like leaves which radiate in densely tufted whorls mostly at the summit of the plant. Tiny, yellowish white flowers bloom in May. During the autumn and winter, heavy pyramids of striking orange-red berries rise from the central tuft of leaves. This shrub is slow to establish in our area and young plants normally drop their leaves and may freeze back, but they become hardier after a few years in a permanent location. Plant on the north or east side of a dwelling with a windbreak of hedges or high trees. May be grown on the south side of a

building if nearby trees provide shade. Does best in well-drained soil with about 50 per cent organic matter. A much-prized and ubiquitous dooryard shrub farther south. A yellowish-fruited form exists.

31. *Osmanthus ilicifolius* (Olive Family). 5–6 feet. HOLLY-LEAF OSMANTHUS
Introduced to gardens, 1856. China

The evergreen, holly-like leaves, 1–1½" long, and small extremely fragrant flowers, recommend this plant for hedge use or as a specimen. It should be planted in a location where it is in full shade during the winter, in a well-drained soil high in organic content. Protection from north and west winds should be provided.

32. *Pieris japonica* (Heath Family). 3–6 feet. JAPANESE PIERIS
Known in gardens, 1870. Japan

This flowering evergreen, although one of the most difficult to grow here, is highly prized for its foliage, cream-colored flowers, and graceful arching branches. In spring, the new terminal shoots appear, pink-tinged and erect like flaming candles in contrast with the pendulous racemes of creamy white flowers that resemble lilies-of-the-valley. Young vigorous plants may grow 5–6 inches a year. A well-grown plant may reach 6 feet after 10–12 years. Early fall and late spring freezes ordinarily damage Pieris more than minimum temperatures of mid-winter. Shade to prevent sun-scald is required at all times. A location on the south side of a wall, near a board fence, high hedge or by a dwelling with further protection on the west and north by trees is recommended. Grows best in well-drained, acid soil, with pH 5.0–6.0. Dislikes drought.

33. *Prunus caroliniana* (Rose Family). 8–10 feet
CAROLINA OR AMERICAN CHERRY-LAUREL.
Introduced to Gardens, 1800. Southeastern United States

A large round-headed, spreading shrub with lustrous green, leathery, cherry-like leaves, 2–3 inches long and nearly 1 inch wide. Sprays of pinkish white flowers appear on the branch ends during May. Fairly hardy, although young plants require protection from winter sun and freezing winds. Hardiness increases with age as plants acquire more bark and hard wood. Plant on the north side of a well or stockade fence or near a high hedge. On the south side of a dwelling, it should have shade to prevent sun-scald. Needs perfectly drained soil, neutral in reaction.

34. *Prunus laurocerasus* 'Schipkaensis' and 'Zabeliana' (Rose Family). 4–6 feet.
BULGARIAN CHERRY-LAUREL
Introduced to gardens, 1898. Southeastern Europe

Cultivated for the lustrous leathery, evergreen laurel-like leaves 3–4 inches long. The 'Schipkaensis' differs from 'Zabeliana' in leaf width, two to three inches wide in the former and usually about an inch wide in the latter. Well-developed specimens of both cultivars form an irregularly shaped, often flat-topped plant nearly as wide as high and not unlike Pfitzer Juniper in aspect. Fairly rapid growing, 3–6 inches a year. Should be grown like the Carolina Cherry-Laurel. Very desirable plants with considerable promise in our area.

35. *Pyracantha coccinea* (Rose Family). 8–10 feet. FIRE THORN
Introduced to gardens, 1629. Southeastern Europe

The typical form develops as a round-headed, sprawling shrub with widely spreading branches. Clusters of small white flowers cover the plant in May. Masses of orange to reddish berries which appear on the short spurs decorate the plant from early autumn throughout the winter. Fast growing;

PYRACANTHA COCCINEA
E·D·

a foot a year may be expected from a young plant in fertile, well-drained soil, pH 6.0–8.0. Fully hardy throughout our area. Thrives best in full sun; hardly worth planting in shade. Extremely useful for a fast-growing clipped hedge, as a dense unclipped screen, or as a specimen plant on the south side of a building where it is difficult to grow other plants in full sun. Highly drought-resistant. Can be successfully espaliered against a wall. Perhaps the finest berried evergreen shrub for our area.

Cultivar—'Lalandii', more upright and the branching habit less divergent than in the typical form.

Viburnum rhytidophyllum. Photo from Horace McFarland Co.

36. *Viburnum rhytidophyllum* (Honeysuckle Family). 6–8 feet.

LEATHERLEAF VIBURNUM

Introduced to gardens, 1900. China

An interesting shrub with unusually large, deeply veined, leathery, drooping leaves, sometimes 8–10 inches long. Forms a dense, round-headed bush. The twigs and underneath side of the leaves are covered with felt-like tomentum. The upper leaf surface is dark green with deep-set veins. The small trusses of white flowers in May are not especially attractive, but the masses of red berries that develop in late summer contrast strikingly with the leathery green leaves. Fast growing, the maximum height may be reached in 6–8 years. Fully hardy, growing best at the edge of a woodland, on the north or east side of a dwelling or near a hedge. Should have protection from sun at all seasons. One of the toughest broadleafs grown here. Does best in slightly acid soil, pH 6.0–7.0.

BROAD-LEAVED EVERGREENS IN SOUTHEASTERN KANSAS—A FRINGE AREA

As compared to the St. Louis area, the climate of Kansas City is drier, and the frequency of strong west winds makes growing of introduced trees and shrubs considerably more perilous than 250 miles east. It is interesting to record below a few kinds of broadleafs that are being grown successfully at Ottawa, Kansas, about 60 miles southeast of Kansas City, in a climate where all but the most adventuresome of plantsmen would say it couldn't be done.

1. *Ilex crenata* 'Rotundifolia' and 'Helleri—both very desirable.
2. *Ilex cornuta*—needs heavy protection.
3. *Ilex opaca* 'Bountiful', 'Cardinal', 'Clarke', 'Hookstraw', 'Merry Christmas'—withstands full sun without burning.
4. *Kalmia latifolia*—requires much protection.
5. *Leucothoë catesbaei*—requires full shade where is does well.
6. *Magnolia grandiflora*—needs protection when young.
7. *Mahonia aquifolium*—does well.
8. Rhododendrons and Azaleas—old iron-clads and some of the Kurumes do well with adequate sun and wind protection.

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SOME FACTS ABOUT SHAW'S GARDEN

The Missouri Botanical Garden (the official name chosen by Mr. Shaw) carries on the garden established by Henry Shaw over a century ago at TOWER GROVE, his country home. It is a private institution and has no support from city or state. The old stone walls and cast-iron fences, the Linnaean House, the Museum, the Mausoleum, and the TOWER GROVE mansion all date from Mr. Shaw's time. Since his death, as directed in his will, the Garden has been in the hands of a Board of Trustees who appoint the Director.

The Garden is open every day in the year (except New Year's and Christmas) from nine A. M. until seven P. M. (spring to fall) and until six (in the winter time) though the greenhouses close at five. TOWER GROVE, itself, Mr. Shaw's old country home, is open from one until four, admission twenty-five cents, with special guides. The Garden is nearly a mile long and has several entrances. The Main Entrance, the one most used by the general public, is at Tower Grove and Flora Place on the Sarah bus line (No. 42). The Park Southhampton buses (No. 80), direct from downtown, pass within three blocks of this entrance and stop directly across the street from the Administration Building at 2315 Tower Grove Avenue. The latter is the best entrance for students, visiting scientists, etc. It is open to such visitors after 8:30 A. M., but is closed on Saturdays, Sundays, and holidays. The step-in gate (more or less concealed by the big Cleveland Ave. gate, 2221 Tower Grove) is nearly always open, and there is a service entrance on Alfred Avenue, one block south of Shaw Avenue.

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FLORICULTURE

Since Mr. Shaw's time an Arboretum has been developed at Gray Summit, Mo., adjacent to State Highways 50 and 66. It is open every day in the year and has two miles of auto roads as well as foot trails through the wild-flower reservation. There is a pinetum and an extensive display of daffodils and other narcissi from March to early May.